

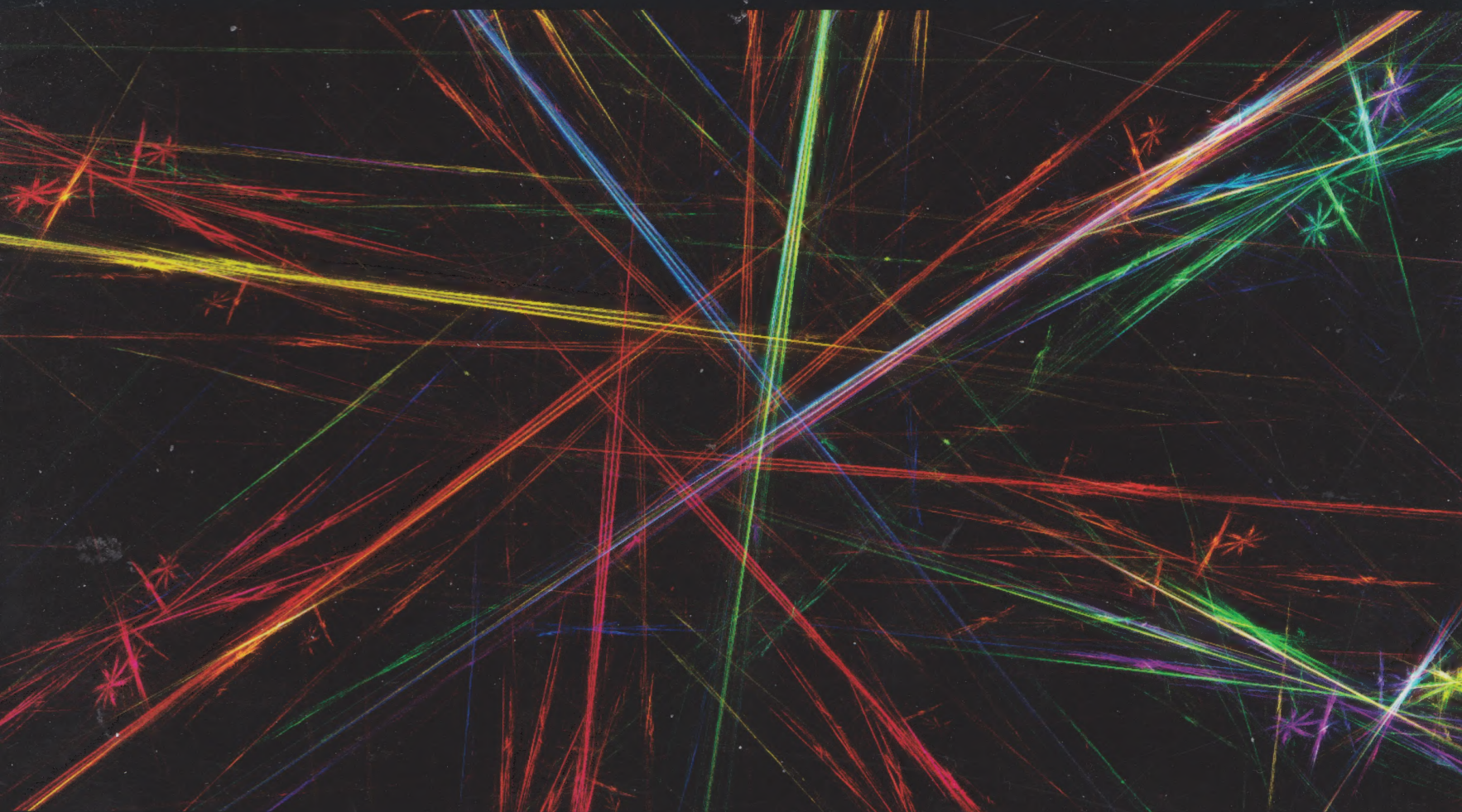


The Open  
University

MST124

Essential mathematics 1

# MST124 Guide









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University

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# Introduction

Welcome to MST124 *Essential mathematics 1*. We hope that you will find studying this module an enjoyable and rewarding experience.

Read this introduction and Section 1 of this MST124 *Guide* before you start working on the study units.

They contain important information about MST124, including what you need to do to prepare for studying it, and how it is assessed.

This MST124 *Guide* contains three main sections.

- **Section 1 Study guide:** This tells you about the structure of MST124, what you need to do before and during your study of it, the support that you can expect to receive, and how you will be assessed.  
You should read this section as soon as possible, as it contains activities that you need to do to ensure that you are ready to begin MST124. When you have completed this section, you should start studying Book A as soon as possible, and by the official MST124 start date at the latest.
- **Section 2 Technology guide:** This gives detailed information about the computing and online components of MST124. You may wish to skim through this section now, and read it in more detail when you need to do so during your studies.
- **Section 3 Accessibility guide:** This section is primarily aimed at those who may have difficulties with one or more elements of MST124 because of a disability, for example.

The MST124 learning materials consist not only of the study texts that are sent to you, but also other essential components, such as the assignments, that are delivered through the MST124 website. You can access this website from your StudentHome page (see the Appendix, on page 48). It will open about two weeks before the official start date of MST124. The MST124 website and StudentHome are described in Subsection 1.2.

Keep this MST124 *Guide* to hand, as you may need to refer to it throughout your studies.

This MST124 *Guide* refers to many online sources of further information, such as websites and online documents. Details of where to find these are summarised in the Appendix.



# 1 Study guide

MST124 *Essential mathematics 1* provides a foundation in the essential mathematical ideas and techniques that underpin the study of mathematics and mathematical subjects such as physics, engineering and economics. As well as studying the ideas and techniques, you will see examples of how they can be applied in a variety of different subject areas.

## 1.1 Introduction to MST124

MST124 contains twelve study units. The main texts of the units are sent to you in four printed books, and are also available in electronic form on the MST124 website. The titles of the units are listed below.

<b>Book A</b>	Unit 1	Algebra
	Unit 2	Graphs and equations
	Unit 3	Functions
<b>Book B</b>	Unit 4	Trigonometry
	Unit 5	Coordinate geometry and vectors
	Unit 6	Differentiation
<b>Book C</b>	Unit 7	Differentiation methods and integration
	Unit 8	Integration methods
	Unit 9	Matrices
<b>Book D</b>	Unit 10	Sequences and series
	Unit 11	Taylor polynomials
	Unit 12	Complex numbers

The units also include online study materials, such as video clips, interactive practice quizzes, applets (computer demonstrations) and exercise booklets. More details of these are given in Subsection 1.3.

During your study of MST124 you will develop your abilities to study mathematics independently, to solve mathematical problems and to communicate mathematics. You will also learn how to use a computer algebra system to support your use and investigation of mathematics.

As well as the four main module books, there are three supplementary texts that are sent to you as printed books: this *MST124 Guide*, the *Handbook* and the *Computer algebra guide*.

You will be assigned a tutor to support your study of the module.



## 1.2 What to do first

This section lists and gives details of activities that you should do before you begin your study of MST124. You should do these activities as soon as possible, so that you are ready to begin your study on the MST124 start date at the latest. You can find the start date in the MST124 description on the Study at the OU website, or from your StudentHome page or the MST124 website. Remember that details of where to find all the websites mentioned in this MST124 *Guide* are given in the Appendix.

Depending on your previous background both in mathematics and as an OU student, you may need to allow several hours to complete these activities. You can do some of them only once the MST124 website has opened, which will be about two weeks before the MST124 start date, so you may need to leave those until then. To ensure that you don't forget to do any of the activities, you could mark the margin of this MST124 *Guide* with a tick next to each activity as you complete it.

### Check your materials

Check that you have received all the items listed in the *Contents checklist* contained in your parcel. You may like to tick off each item as you unpack it. If anything is missing, follow the instructions on the *Contents checklist* to notify the OU, so that replacements can be sent to you.

### Organise your study area

Ideally, you should try to study in a place that is away from distractions, and close to where you can keep all your study materials and the computer that you will be using for MST124.

You are likely to need the following items each time you study MST124:

- the relevant MST124 book
- a computer with a connection to the internet (for details of computer requirements, see 'Check your computer' later in this subsection)
- paper, pens, pencils, an eraser and a ruler
- a basic scientific calculator (for details of suitable calculators, see 'Check your calculator' later in this subsection)
- the MST124 *Handbook* (this is described in Subsection 1.3)
- the MST124 *Computer algebra guide* (again, this is described in Subsection 1.3).

You should also keep this MST124 *Guide* to hand.



## Organise your time

All studying takes time and effort, and distance learning also demands a great deal of organisation and self-discipline. To prepare to study MST124, you need to have a clear picture of what you are going to do and when.

You need to decide when you will study, and how you will find enough time each week to stay on schedule. A typical student is likely to need on average about 9 hours a week to study MST124 and complete any associated work such as assignment questions and attending tutorials, but some people may need more time for some topics.

You need to identify times during the week when you can study productively, and times when you cannot, due to other commitments. You may have to reduce some of your regular commitments or delegate some chores to others to make time for study. You may also need to negotiate with friends and family to ensure that you have enough time for your studies. If you have not studied for a while, you may find it more effective to plan several short study sessions rather than a few long ones until you get into the study habit. For the majority of MST124 you are advised to work in sessions of at least 1–2 hours at a time where possible.

Being self-disciplined about your use of time is the key to developing good study habits, and to not getting overwhelmed by the different tasks and assignment deadlines.

The weeks during which you should be studying each unit are set out in the study planner on the MST124 website. Most units are allocated two weeks of study time. The study planner also includes other key dates, such as the dates by which your assignments must be received (known as **cut-off dates**) and the dates of tutorials.

### Information for joint MST124 and MST125 students

If you are studying *Essential mathematics 2* (MST125) with the same start date as MST124, then you should *not* study the MST124 units on the dates shown on the main MST124 study planner. Instead, you should follow the MST124 and MST125 joint study planner, which is available from the MST124 and MST125 websites. This is important because you will not be prepared to study many of the topics in MST125 if you have not already studied the related topics in MST124. The MST124 and MST125 joint study planner ensures that you study the units of the two modules interleaved in the correct order.

The MST124 assignment cut-off dates shown in the MST124 and MST125 joint study planner are the same as those shown on the MST124 study planner.

If you are studying MST124 and MST125 together, then you will need on average 18 hours study time per week. In the joint study planner, most units are allocated a single week. In some weeks you will study an



MST124 unit, and in others an MST125 unit. There is more information on studying MST124 and MST125 together in Subsection 1.7.

It is important to keep up with the schedule in the study planner as much as possible, or you could find that you have run out of time to study the units needed to complete an assignment before it has to be submitted. If possible, you should try to work ahead of the study planner. Then, if anything unexpected happens in other areas of your life, which disrupts your studying, you should be able to catch up fairly quickly.

Once you have access to the appropriate study planner, note the assignment cut-off dates and then plan your study carefully, taking account of your other commitments.

You may find it helpful to print the study planner and keep it handy, perhaps at the front of the folder where you keep your MST124 work, or pinned up somewhere so you can see it every day. The online MST124 study planner includes a link to a printable version.

The MST124 assignment cut-off dates are also displayed on your StudentHome page.

The final few weeks in the study planner are mainly reserved for revision in preparation for the examination. You should prepare your own revision schedule for these weeks.

There is further advice on organising your study and managing your time on the Skills for OU Study website.

## Check your calculator

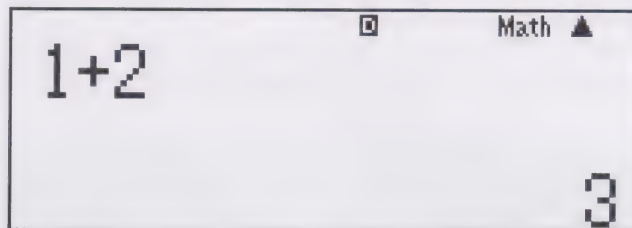
You will need a scientific calculator for some of the activities and assignments in MST124, and for the end-of-module examination. You should use the same calculator while you are studying MST124 as you intend to use in the examination, so that you become familiar with it.

A simple calculator is not suitable for MST124 – you need a *scientific* calculator, which is one that includes function keys such as  $\sin$ ,  $\cos$ ,  $\tan$  and  $\log$ . Also, a calculator with advanced functionality, such as a programmable calculator, is not suitable, because it is not permitted in the examination. A calculator on a computer, mobile phone, tablet or similar device is not suitable either, again because it is not permitted in the examination.

More information about which calculators are suitable for MST124, and permitted in the examination, is given in the MST124 description on the Study at the OU website, and also on the MST124 website. You should find these details and check that your calculator is suitable. If you do not have a suitable calculator, then you should obtain one as soon as possible.

A good option would be one of the *basic* scientific calculators from the Casio ‘natural’ range. These calculators are inexpensive and have various features that make them easy to use, such as the following.

- Two lines of display, so you can see the calculation that you input and the answer at the same time, as illustrated below.



**Figure 1** A modern two-line calculator display

- Input of calculations in the format that they are written. For example, you can calculate  $\sin(30^\circ)$  by inputting  $\boxed{\sin} \boxed{3} \boxed{0} \boxed{=}$ . On older calculators you need to input  $\boxed{3} \boxed{0} \boxed{\sin} \boxed{=}$ .
- Output of some answers as exact values, such as fractions, surds and multiples of  $\pi$ .

MST124 does not teach calculator skills, as you are expected to acquire these before studying the module. You might find it useful to have your calculator manual to hand. Calculator manuals are often available to view or download from the manufacturer’s website. There is a link in the ‘Study resources’ section of the MST124 website to a *Calculator guide*, which describes how to use calculators from the Casio ‘natural’ range.

### Check your computer

Check that you have access to a personal computer of the required specification, as detailed in the MST124 description on the Study at the OU website.

You will need a basic knowledge of how to use your computer. You must be able to:

- navigate around a standard desktop on a computer
- use the mouse or keyboard to open and work with a document, folder or program
- create new folders and documents.

You should also check that you have a suitable web browser, and can use it to access the internet. Suitable browsers include Internet Explorer version 9 (which was released in 2011), any later version of Internet Explorer, and the latest versions of Firefox and Chrome.

Some older web browsers, such as Internet Explorer version 8 or earlier, are too out of date to allow you to access some of the MST124 online teaching materials, namely the applets (computer demonstrations). If you are using Internet Explorer version 8 or earlier, then you should download Firefox or Chrome. (Internet Explorer version 9 will probably be



unsuitable for your computer.) These browsers are free to download and use. For more information on this issue, see Subsection 2.2.

You will need PDF viewer software installed on your computer, so you can view the assignment booklets, for example. Most computers have such software installed already, normally Adobe Reader. Adobe Reader is free to download and use.

To access many OU websites you need your OU computer username (OUCU) and password. You will find this information in the letter that you received when you first registered with the OU.

There is useful advice on using a computer on the Skills for OU Study website, and in the online OU Computing Guide. In particular, the OU Computing Guide includes links to the OU Computing Codes of Conduct, which explain your responsibilities in using OU online resources.

There are further details of how to use your computer for MST124 in Section 2, Technology guide.

## Check your mathematical skills

To be ready to study the mathematics in the later units of MST124, you must be able to work fluently and correctly with basic algebra, graphs, trigonometry, indices and logarithms. To help you improve your skills in these areas, Units 1 to 4 of MST124 include large amounts of revision of these areas, as well as introducing further topics.

If it is some time since you used your basic skills in these areas, and you have lost familiarity with them, then you should plan to allow extra time for studying the first few units of MST124, especially Units 1 and 2. You may need quite a large amount of extra time, depending on the level of your skills. On the other hand, if you are fairly confident with your basic skills, then you should be able to work through these units in the usual amount of study time (about 9 hours per week, on average).

The revision material in Units 1 and 2 covers basic algebra, including indices, and graphs. You may not need to study all of the revision topics in these units, but before you skip a topic you should try some of the activities on it and check your answers, to test your skills. The activities usually become more challenging towards the end of each topic, so make sure that you try activities from throughout the topic. Remember too that even if you have studied a particular topic fairly recently, you will not necessarily have acquired the ‘at your fingertips’ fluency in working with it that you will need for MST124. If this is the case, then you will benefit significantly from working carefully through the topic. In general, you should make the most of the opportunity that Units 1 and 2 give you to refine your basic skills, as these skills are so vital for your studies later in the module.

You should begin studying Unit 1 and then Unit 2 as soon as possible after you have finished working through this section. You may have already started work on them, as they are available on the Mathematics and Statistics induction site. Once you have finished Units 1 and 2, you should

continue working through the other units, as soon as you have access to them.

If you find that a lot of the material in Units 1 and 2 is difficult, or new to you, then you should contact your OU Learner Support Team as soon as possible. Details of how to do this are on StudentHome, in the 'Help Centre', under 'Getting started', 'Essential contacts'.

### Access StudentHome and the MST124 website

Connect to the internet using a web browser, and have a look at your Open University StudentHome page. (See the Appendix for details of where to find it.) This page provides access to all the websites that you need as a student at the OU.

Follow the various links provided on your StudentHome page, and the tabs across its top, to make sure that you can find the following:

- your individual profile (please check that your contact details recorded here are correct)
- your study record for MST124 (and any other current modules)
- the extensive range of OU study support resources (such as the Help Centre and OU Computing Guide)
- The MST124 website (this will open about two weeks before the MST124 start date)
- your MST124 tutor's details (these should appear shortly before the MST124 start date).

The OU Computing Guide contains information on StudentHome, including a short video demonstrating its features, which you may like to watch.

Now have a look at the MST124 website, if it is open. This website provides you with an online 'home' for almost everything that relates to studying MST124.

In the middle of the main page of the MST124 website you can see the MST124 study planner. You can access online items that are part of a study unit, such as video clips and practice quizzes, by clicking on the relevant link in the study planner. Many of these items are also available via links in the right-hand column.

At the top of the right-hand column is a 'News' section. Any urgent messages, such as updated information about assignments or the examination, will be posted here.

Also on the right are your MST124 online forums. These are group discussion areas where you and other MST124 students can post and read messages. You should check that you can access these forums. They should open about a week before the MST124 start date. There are further details about the forums in Subsection 2.5.



Whichever page of the MST124 website you are viewing, you can always return to the main page by clicking the link beginning MST124 above the left-hand column of the page.

You should visit the MST124 website at least twice a week, to check for the latest news and information.

## Watch the 'Welcome to MST124' video

There is a short video on the MST124 website that introduces you to some of the components of MST124, and shows you what to expect as you work through the module. You should watch it as soon as is convenient for you.

## Install the computer algebra system

As part of your study of MST124 you will learn how to use a computer algebra system (CAS). This system is described in the MST124 *Computer algebra guide*, which is sent to you as a printed book and is also available in electronic form on the MST124 website. You should work through the Introduction and Section 1 of the *Computer algebra guide* as soon as possible, to install the system on your computer so it is ready for when you need it. The study units tell you when to use it.

## 1.3 Components of MST124

The main components of the MST124 learning materials are listed below (some of them have been mentioned already):

- twelve study texts, in four printed books
- the *Handbook*, a printed book
- the *Computer algebra guide*, a printed book
- applets, available on the website
- tutorial clips and videos, available on the website
- interactive practice quizzes, available on the website
- exercise booklets, printable from the website.

More details about these components are provided below.

### Study texts

The twelve main study texts for MST124 are sent to you in four printed books, and are also available in electronic form on the MST124 website.

Each study text is structured in a similar way, and consists of a mixture of explanations of the mathematics, worked examples and activities. The examples show you how to do the mathematics and how to set out your working, and the activities ask you to do some mathematics yourself.

As you read through an explanation or example, you should try to make sure that you understand each step, and how it follows from the previous steps, without losing track of the overall objective. You should work through each activity carefully, and try not to skip any activities or activity parts, because the only effective way to learn mathematics is to try it for yourself. There are solutions to the activities at the end of each unit, which you should use to check your answers, or to obtain a hint if you are stuck. You will probably want to make notes for yourself as you study. There is further advice on study techniques in Subsection 1.6.

Within each unit, the key facts and strategies are highlighted in green boxes like the one below, so you can refer to them easily.

### Pythagoras' theorem

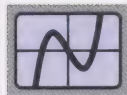
For a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

You will also see blue boxes like the one below, which describe some of the rich history of mathematics, or contain other interesting items.

‘Mathematics is the gate and key of the sciences. . . . Neglect of mathematics works injury to all knowledge, since he who is ignorant of it cannot know the other sciences or the things of this world. And what is worse, men who are thus ignorant are unable to perceive their own ignorance and so do not seek a remedy.’

Roger Bacon (c.1267), translated by Robert Bell Burke (1928) in *The Opus Majus of Roger Bacon*, Part 4, Chapter 1, Oxford University Press, p. 116.

At some points in the unit texts you will notice one of the three icons shown in the margin.



The first icon appears next to some activities. It indicates that you need to use the computer algebra system (CAS) in the activity, as directed. Some of these activities involve working through substantial sections of the *Computer algebra guide*.



The second icon appears next to some activities and also next to a few diagrams. It represents the internet, and indicates the use of an *applet*, which is available on the MST124 website. Where the icon appears next to an activity, it indicates that you need to use an applet to investigate a mathematical concept in the activity, as directed. Where it appears next to a diagram, it indicates that an interactive version of the diagram is available as an applet.



The third icon appears next to many worked examples, and occasionally next to a piece of text. It represents a ‘play’ button. Where the icon appears next to a worked example, it indicates that the example has an associated *tutorial clip*, a short video in which a tutor explains the worked example. Where it appears elsewhere, it indicates a piece of text that has an associated short video, other than a tutorial clip.



These components of MST124 are explained in more detail later in this subsection.

Some units have additional associated material on the MST124 website, such as more detailed or alternative explanations of certain topics. Each such piece of material is individually mentioned in the units.

The MST124 materials have been carefully checked, but occasionally updates are needed or errors are discovered. The necessary corrections, which are known as *errata*, are provided on the MST124 website. You should check the errata as soon as possible, and correct your printed materials.

## MST124 Handbook

The MST124 *Handbook* is a printed book that is sent to you. Like all the printed materials, it is also available in electronic form on the MST124 website.

The *Handbook* should be your constant study companion. It summarises the key ideas, techniques and formulas in each unit. You can also annotate it with your own notes. You should use it throughout your studies, so you become familiar with its layout.

You are allowed to take your *Handbook* (the copy that was sent to you), with your added annotations, into the end-of-module examination.

There are restrictions on the sorts of annotations that are permitted on the copy of the *Handbook* that you take into the examination. You can write notes on the pages in pencil or pen, but you may not include additional pages, replace pages or add sticky notes or index tabs. These restrictions are formally set out in the *Examination Arrangements* booklet, which will be made available to you shortly before the examination.

It is a good idea to initially use pencil or sticky notes for your annotations, until you are confident about which annotations are the most useful. You must check that you have removed all sticky notes before the examination.

Although you can take the *Handbook* into the examination, you should still aim to learn as much of the module material as you can. You should find that you start to remember it as you practise the mathematics and look up items in the *Handbook*. Re-reading parts of the units will also help. The more you can remember, the easier and quicker you will find it to study the MST124 materials, do the assignment and examination questions, and study further modules with mathematical content.

If you are studying *Essential mathematics 2* (MST125) at the same time as MST124, then you should discard your MST124 *Handbook* and instead

use the MST125 *Handbook*. It contains all the information in the MST124 *Handbook*, as well as summaries of the MST125 material. You can take the MST125 *Handbook*, in place of the MST124 *Handbook*, into the MST124 examination.

## MST124 Computer algebra guide

The MST124 *Computer algebra guide* teaches you about the computer algebra system (CAS) used in MST124.

At some points in the units you are directed to work through sections of the *Computer algebra guide*. You do not need to read sections of the *Computer algebra guide* until you are directed to do so.

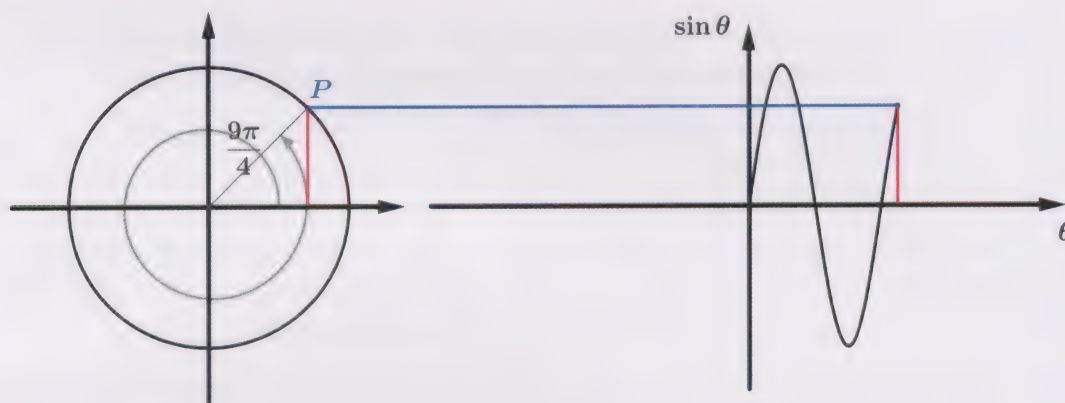
You should also find that the *Computer algebra guide* is useful for reference when you do activities that ask you to use the CAS to do some mathematics. In particular, for each such activity the *Computer algebra guide* contains details of how to use the CAS for the mathematics in the activity, for you to look at if you get stuck or need a hint.



Each point in a unit where you are asked to use the CAS is indicated by an icon in the margin of the text, as shown here.

## Applets

Many of the MST124 units include small interactive computer applications, known as *applets*, which are designed to enhance your understanding of mathematical ideas. For example, the applet shown in Figure 2 allows you to investigate how the graphs of the sine and cosine functions arise.



**Figure 2** An applet

Most of the applets are used in activities that ask you to investigate mathematical concepts. A few applets are interactive versions of diagrams in the units. Each applet includes on-screen instructions.



Each point in the unit where you are asked or invited to use an applet is indicated by an icon in the margin of the text, as shown here. You can access the applets from the MST124 website, and you can also download them to use offline. There are further details about using the applets in Subsection 2.2.



## Tutorial clips and videos

Many of the worked examples in the units have an associated *tutorial clip*. This is a short audio-visual presentation of the worked example. In it you will see a tutor work through the example, as they would in a tutorial, explaining each step as they go. Figure 3 shows a still image of a tutorial clip.

Differentiate the function

$$y = \sin(x^2).$$

Here  $y = \sin u$  where  $u = x^2$ .

So  $\frac{dy}{du} = \cos u$  and  $\frac{du}{dx} = 2x$ .

By the chain rule,

$$\begin{aligned}\frac{dy}{dx} &= \frac{dy}{du} \frac{du}{dx} \\ &= (\cos u)(2x) \\ &= (\cos(x^2))(2x) \\ &= 2x \cos(x^2)\end{aligned}$$



**Figure 3** A tutorial clip

You can watch a tutorial clip instead of, or as well as, reading through the associated example in the unit. They are particularly helpful for complicated techniques and tricky topics. Most tutorial clips run for between 1 and 15 minutes. Worked examples that have associated tutorial clips are indicated by a play button icon in the margin, as shown here.



MST124 also includes a small number of videos that are not tutorial clips. These give additional background information on certain topics. They are mentioned individually in the units, at points indicated by the play button icon.

You can access the tutorial clips and videos from the MST124 website, and you can also download them to view offline. There are further details about using them in Subsection 2.3.

## Practice quizzes

Each study unit has an associated interactive practice quiz, which helps you consolidate your learning by trying out your skills and knowledge. It is usually most effective to try the practice quiz as you come towards the end of studying the unit. The practice quizzes also provide a good way for you to revise topics in preparation for the examination. Figure 4 shows an example of a practice quiz question.

Differentiate the function  $f(x) = (5x^2 - 3x - 7)e^x$ .

$f'(x) =$

Check

**Figure 4** A practice quiz question

Your marks for a practice quiz do not count towards your final result for MST124. Your tutor has access to the marks that you obtain, the questions that you are asked and the answers that you give, though there is no expectation that he or she will look at these.

Whenever you work on a practice quiz, you should have your calculator, the *Handbook*, paper, and a pen or pencil with you, since for most questions you will need to do some working. You may also find it helpful to have the relevant study text to hand.

You can do each practice quiz as many times as you like. The questions will usually be different each time, and different from the questions that other students are given.

You can attempt each question up to three times. After each attempt, you will receive immediate computer-generated feedback on your answer, and a reference to the relevant part of the study materials. Your marks for the question decrease with each incorrect attempt.

If you want to discuss the details of a practice quiz question with your tutor, you will need to tell him or her the details of the question.

You can access the practice quizzes from the MST124 website. There are further details about using them in Subsection 2.4.

## Exercise booklets

Each study unit also has an exercise booklet, which contains additional questions and their solutions, for you to use to consolidate your learning. As with the practice quizzes, usually the most effective time to try the questions in an exercise booklet is as you come towards the end of studying the unit. The exercise booklets also provide a good way for you to revise topics in preparation for the examination. They are available from the MST124 website.



## 1.4 Assessment

Assessment and feedback are essential parts of learning. You need constructive feedback to enable you to improve your performance in future work.

The activities in the units, the practice quizzes and the exercise booklets all give you opportunities for *self-assessment*, to help you check your understanding and reinforce your learning.

In addition to these, there are three types of formal assessment that count towards your final result for MST124. These are tutor-marked assignments (TMAs), interactive computer-marked assignments (iCMAs) and the end-of-module examination.

The TMAs and iCMAs will be made available on the MST124 website at appropriate times during your studies – they will not all be available at the beginning of MST124. The dates by which you must submit these assignments, known as **cut-off dates**, are given in the MST124 study planner and also on your StudentHome page. You should note these important dates now, if you have not already done so.

You must access the TMAs and iCMAs from the MST124 website. You will not be sent paper copies of assignments.

Most students find it best to start working on the assignment questions for each unit fairly soon after studying the unit. It is usually not a good idea to defer starting work on an assignment until close to the cut-off date. This is because you may need time to revise some topics or contact your tutor with questions, and you are unlikely to produce your best work if you are under time pressure. Also, something unexpected might happen near the cut-off date, so you should allow some contingency time.

The Open University's general rules and regulations about submitting assignments and sitting examinations are described in the *Assessment Handbook*, which is available from your StudentHome page.

Details about the TMAs, iCMAs and end-of-module examination are given below, followed by information about how your overall final result is calculated.

Tutor-marked assignments (TMAs)

There are four assignments for which you must send written answers to your tutor. These assignments are known as **tutor-marked assignments**, or **TMAs**. Your tutor will mark your answers, and provide you with feedback on them.

Before you start work on the first TMA, you must read the document ‘Instructions for preparing and submitting TMAs’, which is available from the MST124 website.

Table 1 sets out which units are assessed in which TMAs.

**Table 1** Units covered in TMAs

TMA	Units covered
TMA 01	1, 2
TMA 02	3, 4, 5, 6
TMA 03	7, 8, 9
TMA 04	10, 11, 12

The TMAs will be available to download from the MST124 website. You are advised to print out each TMA, to make it easier to work on over a period of time.

The cut-off date for each TMA is the last date on which your tutor will accept your work for marking, unless there are reasons why you should be allowed an extension to the deadline. If you are concerned about meeting a TMA deadline, then you should contact your tutor well before the cut-off date. An extension for the final TMA (TMA 04) is not normally allowed.

The TMAs assess not just your mathematical abilities, but also your ability to communicate written mathematics. Some marks, known as *good mathematical communication* (GMC) marks, are allocated for this. Unit 1 includes guidance on writing mathematics well, and the solutions to the activities and examples given in the units are examples of well-written mathematics.

The feedback on your TMA that your tutor provides will usually indicate what you have done well, point out any misunderstandings and errors, and make suggestions for improving your future work. This feedback is an important part of the learning process. You should read it carefully and act on it to improve your work in later assignments and in the examination.

Interactive computer-marked assignments

There are four assignments for which you must input your answers online. These assignments are known as **interactive computer-marked assignments**, or **iCMAs**. They are similar to the practice quizzes, but your marks for them count towards your final result.



It is strongly recommended that you work through the practice quiz for each unit, so that you are well prepared for the iCMA questions and familiar with the correct way to input your answers.

Table 2 sets out which units are assessed in which iCMAs.

**Table 2** Units covered in iCMAs

iCMA	Units covered
iCMA 41	1
iCMA 42	2, 3, 4
iCMA 43	5, 6, 7, 8
iCMA 44	9, 10, 11, 12

The iCMAs will be available from the MST124 website. As with the practice quiz questions, whenever you work on iCMA questions, you should have your calculator, the *Handbook*, paper, and a pen or pencil with you. You may also want to refer to the relevant study texts.

Before you start work on each iCMA, you should read the instructions at the beginning of it. You will be required to confirm that the answers that you submit for the iCMA are all your own work.

Each iCMA will be available for you to work on for several weeks. You do not have to complete all the questions in an iCMA in one session; you can answer a few questions at a time, in any order. Your answers will be automatically saved whenever you move to a different question. You can return to any question and change your answers, at any time before you submit the iCMA.

To submit an iCMA, you click its 'Submit all and finish' button. You must submit each iCMA before 23:59 (UK time) on its cut-off date, even if you have not answered all the questions. If you do not submit the iCMA by 23:59 on the cut-off date, but you have answered at least one question, then you will have an additional seven days to submit the iCMA. During this time you will not be able to answer any further questions, nor change any existing answers.

No extensions to iCMA deadlines are permitted under any circumstances.

Please note the following important points.

- You can submit each iCMA *only once* (by clicking the 'Submit all and finish' button). So take care not to submit the iCMA until you are satisfied with your answers to all the questions.
- For your answers to an iCMA to count towards your final result, you *must submit* the iCMA.

You are strongly advised to attempt all of the questions in an iCMA, and to resist the temptation to guess answers, unless you are very short of time.

Once you submit an iCMA, you will receive computer-generated feedback on your answers. You can read the feedback again later by revisiting the iCMA. It will be available at least until the end of the module. Your official score for the iCMA will be displayed on your StudentHome page soon after the cut-off date.

Your iCMA questions will not be exactly the same as those of other students, but they will be of the same level of difficulty. As with the practice quizzes, your tutor has access to your iCMA marks, the questions that you were asked and the answers that you gave, but there is no expectation that he or she will look at these. If you want to query an issue about a particular iCMA question with your tutor, then you will need to tell him or her the details of the question.

There are further details on iCMAs in Subsection 2.4.

### End-of-module examination

Details of the format of the end-module examination are provided in the 'Assessment resources' area of the MST124 website, along with a specimen examination paper, with sample solutions.

A document entitled 'How to prepare for and succeed in examinations in mathematics and statistics' is available from the same area of the MST124 website.

You should read all of these important documents carefully, well before the end of the module. However, it is a good idea to use the specimen examination paper to practise completing the paper, unseen, in the allotted time, so you might prefer not to look at it, or to only skim it, until you are ready to do this. You should make sure that you are familiar with the format of the paper, and the method for recording your answers, before you sit the real examination.

Details of the date, time and venue of the examination will be provided on your StudentHome page, a few months before the end of the module.

You should begin revising the module material in preparation for the examination as soon as you have finished the final unit. Helpful ways to revise can include reading the *Handbook*, reading the notes that you have made, re-reading parts of the units that you have forgotten, making summary notes, reading the feedback from your tutor, doing the practice quizzes and exercise booklets, and perhaps re-doing some of the activities in the units. The most important part of your revision is to practise doing questions similar to those that you can expect to be in the examination. Towards the end of your period of revision you should practise doing the specimen paper in the allotted time. There is more advice in the 'How to prepare for and succeed in examinations in mathematics and statistics' document, which is available from the MST124 website.



## Your final result

Your overall result for MST124 is based on the following two scores.

- Your **overall continuous assessment score (OCAS)**. This is the weighted average of the scores that you obtain in the four TMAs and the four iCMAs. The weightings are given in Table 3.
- Your **overall examinable component score (OES)**. This is the score that you achieve in the examination.

**Table 3** Weightings for your overall continuous assessment score (OCAS)

Assignment	Units covered	OCAS Weighting
TMA 01	1, 2	9%
TMA 02	3, 4, 5, 6	22%
TMA 03	7, 8, 9	22%
TMA 04	10, 11, 12	22%
iCMA 41	1	2%
iCMA 42	2, 3, 4	7%
iCMA 43	5, 6, 7, 8	8%
iCMA 44	9, 10, 11, 12	8%

Note that if your score on any TMA (except TMA 01) or iCMA (except iCMA 41) is lower than your calculated OCAS, then your score for up to one TMA and up to one iCMA will be substituted, to your advantage, and your OCAS recalculated, as explained in the *Assessment Handbook*.

Based on your OCAS and your OES, you will be awarded one of the following results:

- Pass 1 (distinction)
- Pass 2
- Pass 3
- Pass 4
- Fail

For you to be awarded a Pass 1, Pass 2, Pass 3 or Pass 4 result, your OCAS and your OES must *separately* reach thresholds that are determined by the MST124 Examination and Assessment Board for that result.

Normally, for a Pass 4 result you must achieve at least 40% for OCAS and at least 40% for OES.

Normally, for a Pass 3 result you must achieve at least 55% for OCAS and at least 55% for OES.

On some Mathematics and Statistics qualifications you need at least a Pass 3 result for MST124 before you are allowed to progress to later modules.

For more details on how your overall result is calculated, see the *Assessment Handbook*.

## Your assessment record

Your assessment record, which you can find on your StudentHome page and also via the MST124 website, lists your scores for the assignments to date. From your assessment record you can also access the Assessment Calculator, which helps you determine how you are progressing with your assignment scores, and see the effect of any substitution.

## Plagiarism

The purpose of the MST124 assignments is to assess your understanding of the material taught, and your ability to apply it. This can be done only if the work that you submit is entirely your own.

*Plagiarism* is copying someone else's work without acknowledgement. It is a disciplinary offence and is taken very seriously by the University. You must work on each TMA and iCMA question on your own.

Note that in MST124 and in most other mathematics modules it is acceptable (and in fact often sensible) for you to copy the format of, and the words in, the examples and activities in the units. This is not considered to be plagiarism, as the mathematics in your work will be different from the mathematics in the unit. What you must not copy is someone else's solution to all or part of an assignment question.

You can find more advice on plagiarism in mathematics under the 'Good academic practice in mathematics' link in the 'Study Resources' area of the MST124 website. There is more general information on plagiarism in the *Assessment Handbook*. There is also a section on plagiarism on the OU Library's 'Being digital' website.

You must not post any assignment questions, or answers to them, on any internet sites or social networks, or advertise them for sale, as this constitutes a breach of copyright and/or the promotion of plagiarism.

## Special circumstances

If at any stage you are having difficulty in completing an assignment, or if you anticipate that you will have problems in the examination, then your first step should be to contact your tutor to discuss what to do.

However, if serious circumstances beyond your control arise, which prevent you from submitting a TMA or iCMA, or result in your having to submit a TMA or iCMA that is incomplete or otherwise well below your usual standard, or affect your performance in the examination, then you should consider reporting these circumstances to the University, so that the MST124 Examination and Assessment Board can take them into account when it determines your overall result. For information about the sorts of circumstances that will be taken into account, how they will be taken into account, and how to report them, see the *Assessment Handbook*.



## 1.5 Support for your studies

You are not alone when studying MST124. Support is available from your tutor and other students, through face-to-face or online tutorials, and via the MST124 website, as explained below.

If you experience difficulties that are not directly related to the content of MST124, then you should contact your Learner Support Team – see your StudentHome page for details.

### Support from your tutor

You will be assigned a tutor (also known as an associate lecturer or AL) for MST124. Your tutor's details will appear on your StudentHome page shortly before the MST124 start date. You will be one of about twenty students in a tutor group.

Your tutor will probably contact you during the first few weeks of MST124. Alternatively, you may like to make the first contact, by sending an email. Your tutor will be delighted to hear from you. You may like to tell him or her a little about your previous mathematical studies, or why you decided to study MST124.

Your tutor is there to help you with any mathematical problems that you encounter, and he or she can also provide advice on other matters related to your progress, such as study skills, how to write mathematics well and what to do if you are worried about completing a part of the module in time. Your tutor will also mark your TMAs, and provide feedback on them to help you improve your work.

Your tutor may offer face-to-face tutorials, or online tutorials using a system called OU Live, or a mixture of both. The dates of the tutorials are given in the MST124 study planner. There is a link to OU Live in the right-hand column of the MST124 website, and further details about using it are given in Subsection 2.7.

Although tutorials are optional, you are encouraged to attend them if you possibly can. Seeing your tutor explain ideas and techniques in his or her own way, with the opportunity for you to ask questions, will usually improve your understanding and consolidate your learning. Tutorials also provide an excellent way for you to sort out any mathematical problems that you have, improve your preparation for the assignments and the examination, and get to know your tutor and other students.

You are welcome to attend tutorials given by other tutors, unless a limit on the number of students has been reached, which rarely happens. You can find details of these tutorials by using the online Tutorial Finder (which you can access from StudentHome), or by contacting your Learner Support Team. To request to attend one of these tutorials, you should fill in the 'Request alternative tutorial' form on the Tutorial Finder webpage. The tutor will respond if there is a reason why you *cannot* attend the tutorial, so if you do not receive such a message, then you can go ahead and attend the tutorial. However, if you do not receive a response, then it

is worth checking the online Tutorial Finder shortly before the tutorial, in case there have been any last-minute changes.

OU tutors are extremely dedicated people who want to help you with your studies, so don't hesitate to contact your tutor for help or advice. Your tutor will tell you when and how it is best to contact him or her. Some tutors will give preferred times to be called by phone. Your tutor will usually read and respond to OU email at least twice a week, when not on leave. Please have reasonable expectations of your tutor: tutors want to help you, but most work for the OU for only a small proportion of their time.

### Support from other students

You have access to online forums where you can discuss MST124 with other students. You and the other students can use these forums to help each other, by asking and answering questions, and by suggesting study tips. Trying to explain an idea to someone is often an excellent way of improving your own understanding. You should also find it interesting and reassuring just to see how other students are getting on with MST124.

You can use the forums to discuss all aspects of MST124, and other issues related to your studies, but you must not discuss answers to TMA or iCMA questions. Please do not state your assignment scores in the forums, as students who did worse than you may be discouraged, or think you are boasting. It is fine to say that you are pleased or disappointed with your score.

The forums are monitored by one or two MST124 tutors, who will intervene if inappropriate or incorrect messages are posted. Please always communicate on the forums in a reasonable manner, to help maintain them as a friendly, supportive environment where everyone can participate without fear of being ridiculed, abused or upset.

In your use of the forums you are expected to abide by the OU Computing Codes of Conduct (available via the OU Computing Guide). On the rare occasions that a person's behaviour becomes unacceptable, the University will exclude that person from the University network.

For information on how to access and use the online forums, see Subsection 2.5.

### Support from the OU Library

As a registered student you can access the wide range of online resources provided through the OU Library's subscriptions. See the 'Library resources' section on the MST124 website for links to some resources that may be helpful. If you need help with any of these resources, then you should contact the Library Helpdesk by phone, email or webchat. The contact details are on the OU Library website.



## 1.6 How to study

This subsection suggests some ways of studying that may help you succeed with MST124. Different people have different approaches to study, and what works best for you may be different from the suggestions here.

### How to read a unit

You will gain most benefit from your study if you engage with the text as you read it. You should study the text with a pen or pencil, and paper, to hand, making your own notes as you go along. As mentioned earlier, you should try to make sure that you understand each step of an explanation or an example, and how it follows from the previous steps. You might like to try to anticipate what the next line of an example might be. You should attempt each activity in the unit, writing out your solution and perhaps annotating it with brief notes about anything that you first got wrong but then corrected, or found difficult but then resolved. Writing out your solutions will give you useful practice in writing mathematics, and you can refer to them when you do assignment questions and when you revise for the examination.

The secret of good note-taking is to achieve a sensible balance between length and detail, so that you note the important facts and not too much unimportant detail. It is sometimes not easy to decide what is important, but most people will want to make notes about new definitions, new symbols and notation, and important theorems and techniques. Your notes might include lists, worked examples and diagrams. You might find it helpful to annotate the unit texts themselves.

Try to organise your solutions to activities and your other notes in a way that makes it easy to refer to them later. For example, you might use a ring binder or a notebook.

Don't forget that the practice quizzes and exercise booklets provide additional practice in the techniques in each unit.

### How to approach a mathematical problem

Throughout MST124 you will need to solve mathematical problems, both in the activities in the units and in assignment questions. Here are some suggestions of how to approach these.

When you are faced with a written question or problem to solve, you should first read it carefully, making sure that you understand exactly what is required. You may find it helpful to underline or highlight some parts. It is important that you get to grips with the question in two ways: first, absorb the information given, and, second, find out what the question is really asking. This way of analysing a question can be summarised by the following questions.

- What do I know?
- What do I want?

Your solution should link these.

Try to decide not only what you know from the question itself, but also which of the facts and techniques that you already know might help with the problem. If the problem is about a practical situation, then you have to start by translating it into a mathematical form. It might help to draw a diagram or a graph, or use a formula that you know, or all of these. When you consider what you want, you should first decide whether you have to find an answer or show that something is true. If you do not take the time to do these things, then you may end up not really answering the question, or may get unnecessarily stuck.

If you're not sure how to solve the problem, try to find similar examples and activities in the module texts, if possible. Use these for ideas, but think carefully about how your problem differs from the ones in the text.

Once you have some ideas for a solution, try to write out your thinking as clearly as possible, so that you can easily understand each step and why it follows from earlier steps. You may find that leaving the problem for a while and then coming back to it helps you to see things more clearly. If you do this, then make sure that you have written down what you have done so far.

When you have found a solution, you should check your answer, ideally by using a different method. Also, check that your answer makes sense in the context of the problem.

When you write out your solution to a TMA question, remember that you are trying to communicate with your tutor. There is guidance on how to communicate mathematics in Unit 1, and in each MST124 TMA some marks are allocated for how well you have done this. Remember that the solutions to the examples and activities in the study texts are examples of good mathematical communication, and can be a useful guide to what and how much to write.

### What to do when you are stuck

Getting stuck with mathematics sometimes is inevitable – it happens to us all. You might get stuck when trying to understand something in a unit, or when trying to do an activity or an assignment question. When you are stuck, it is often worth spending a few minutes trying to resolve it yourself – if you can, then you are likely to learn from the process, and you should remember what you have learned more easily in future. It may help to look back at the material that led up to that point, and make sure that you fully understand it. If are trying to do an activity or assignment question, then try looking back at the relevant unit, or your notes, to find a similar example, if you have not done so already. Think also about whether any of the facts and techniques that you learned earlier in your mathematical studies might be helpful. Sometimes it can help to take a break, and come back refreshed. Sometimes it is useful to discuss the issue with someone – the act of explaining exactly why you are stuck can be enough to help you resolve the problem.

You should not spend a large amount of time puzzling over a particular point without making progress, however. Many difficulties can be resolved



rapidly with help from your tutor or other students, leaving you more time to get on with the rest of the unit or assignment. Subsection 1.5 tells you how to obtain such help, and other support, from your tutor and other students.

## 1.7 Studying MST124 and MST125 together

If you are not studying MST125 within the next year, then you can skip this subsection. Otherwise, read either the information headed ‘MST124 and MST125 starting at the same time’, or the information headed ‘MST124 and MST125 starting a few months apart’, according to your plans.

### MST124 and MST125 starting at the same time

Studying MST124 and MST125 (*Essential mathematics 2*) starting at the same time is recommended only if you are already very confident with algebra, graphs, trigonometry, indices and logarithms, and you also have plenty of time for studying.

If you have chosen to study MST124 and MST125 starting at the same time, then you should find that you can get through the revision material in Units 1 and 2 of MST124 fairly quickly, as it should mostly be very familiar to you. If you find that this is not the case, then you should contact your Learner Support Team as soon as possible, to discuss what to do. For example, you may be able to defer your study of MST125 to a later start date.

As mentioned in Subsection 1.2, if you are studying MST124 and MST125 starting at the same time, then you should *not* study the MST124 units on the dates shown on the main MST124 study planner. Instead you should follow the MST124 and MST125 joint study planner, which is available from the MST124 and MST125 websites.

The joint study calendar directs you to study some of the MST124 units earlier than the dates shown on the main MST124 study calendar, and to study some of the MST125 units later than the dates shown on the main MST125 study calendar. This is so that you are prepared to study topics in MST125 for which you need to know material in MST124.

This means that you will be ready to complete some of the MST124 assignments earlier than students studying MST124 without MST125.

It is particularly important for you to aim to complete each MST124 TMA and iCMA within a few days of finishing the last unit covered in the TMA or iCMA, even if the cut-off date is later.

This is because the assignments are part of the learning process – they help you to consolidate your learning. Also, if you do not do this, then you

may find that you have a lot of assignment work to complete for the two modules at around the same time.

Make sure that you do not forget to submit each TMA that you have completed early. Unfortunately, even if you submit a TMA early, you will not receive your marked work back early, as the University does not return marked TMAs until after the cut-off date.

You can submit each iCMA as soon as you have completed it. You will then immediately receive computer-generated feedback on your work.

Because you will be working ahead of some other students on MST124 for some parts of the module, some MST124 tutorials may cover topics at a later time than is ideal for you. Similarly some MST125 tutorials may cover topics at an earlier time than is ideal for you. So you will need to rely a little more on your own independent study than students studying the two modules separately.

Note that the joint study calendar directs you to omit Unit 1 of MST125. This is because the content of this unit is revision of some of the material in MST124.

### **MST124 and MST125 starting a few months apart**

If you have chosen to study MST125 with a start date a few months later than the MST124 start date, then you should be able to study both modules in the same way as students studying them completely separately. The only difference is that, like students studying the two modules starting at the same time, normally you should not study Unit 1 of MST125, which revises some of the material in MST124. There is more advice on this in the *MST125 Guide*. You should also take particular note of the assignment cut-off dates, as they may occur at around the same times for the two modules. Make sure that you plan enough time to complete each assignment.

## **1.8 Learning outcomes**

Every Open University module has a set of **learning outcomes**. These are statements of what a student is expected to know, understand and be able to do at the end of the module. The overall learning outcomes for MST124 are as follows. Some of the words may not mean much to you at this stage, but you should understand them all after you have completed the module. More detailed learning outcomes are given at the end of each unit.



## Learning outcomes for MST124

### Knowledge and understanding

- Understand and use the main ideas and techniques of basic calculus, including the differentiation and integration of a variety of functions, standard rules for differentiation and integration, the relationships between calculus and the graphs of functions, and the representations of functions as Taylor series.
- Understand and work with the basic ideas of vectors, in two or three dimensions, and matrices.
- Understand and work with trigonometric identities, simple sequences and series, the binomial theorem, complex numbers and algebraic representations of circles.

### Cognitive skills

- Choose and use appropriate strategies for problem solving, in both practical and abstract contexts.
- Use moderately complicated mathematical techniques.
- Understand texts involving moderately complicated mathematics.

### Key skills

- Work fluently and accurately with basic algebra (including algebraic fractions and indices), trigonometry, graphs, exponentials and logarithms.
- Communicate mathematics effectively in writing.
- Use a computer algebra system.
- Study independently.

### Practical skills

- Think logically about problems and apply relevant techniques, including use of a computer, to a variety of situations.
- Work on tasks independently, and manage time.

## 1.9 Queries and how to contact the OU

The best way to contact the OU for almost all sources of help is via the links in StudentHome. Alternatively, you can use the Student Registration and Enquiry Service number: +44 (0)845 300 6090.

In all contact with the University, you should give your name and student number (personal identifier, PI) and the module code (which is MST124). In any emails that you send via StudentHome, your name and PI are included automatically. If your query is specifically about the content of MST124, please note the contact details given in Table 4.

**Table 4** Contact details for MST124 issues

Problem	Whom to contact
Clarification and/or help on any of the MST124 materials, queries about assignments or suspected errors	Your tutor in the first instance, or the MST124 forum.
Comments on MST124 itself	The MST124 team: Email: MCT-Maths-Stats-Programme@open.ac.uk Phone: +44 (0)1908 332555.
Problems with <i>using</i> the computer algebra system	Your tutor in the first instance, or the MST124 forum.
Problems with <i>installing</i> the computer algebra system	The OU Computing Helpdesk (via the link in the OU Computing Guide).
General problems with using your computer for OU study, or with OU online services	Check the OU Computing Guide in the first instance, or contact the OU Computing Helpdesk (via the link in the OU Computing Guide).

The OU Computing Helpdesk provides technical support for OU-provided IT services and applications, including online forums and tutorials, problems with usernames or passwords, and access to websites and other online facilities. It does *not* provide help with system or hardware queries (such as questions about your internet connection, or installing hardware or operating systems).

When you contact the Helpdesk it will help to resolve your query quickly if, as well as giving your student number and module code (MST124), you can supply detailed information about the problem that you are experiencing, including the full text of any error messages, and which operating system your computer has (such as Windows XP, Windows Vista or Windows 8).



## 2 Technology guide

This section provides information that will help you to use the computing and online components of MST124. These components include the tutorial clips, videos, applets, interactive computer-marked assignments (iCMAs), practice quizzes and several computer-based tools that you can use to communicate with your tutor and other students.

You might find it useful to skim through this section now, to get an idea of the sort of information that it contains, and then refer back to it as necessary. Any updates to the information given here will be provided via the MST124 website.

If you need further help with any of the computing and online components of MST124, then see the contact list in Subsection 1.9.

### 2.1 Computing safely

Since you will need to use your computer quite a lot for MST124, it is worth ensuring that you have set up a comfortable computer workstation, to avoid wrist, back and eye problems. There is information on how to do this, and some guidance on good working practice, in the ‘Using a computer’ section of the online OU Computing Guide.

You should avoid sitting at your computer for long periods of time without a break.

You should ensure that you have minimised the risk of your computer becoming infected by computer viruses, and the risk of other computer attacks. There is information on how to do this in the OU Computing Guide.

### 2.2 Applets

The MST124 applets are small interactive computer applications, as described in Subsection 1.3. You can access them from the MST124 study planner.

To access and use the applets you need a web browser that supports a technology known as HTML5. Suitable web browsers include recent versions of Firefox and Chrome, and Internet Explorer version 9 or later. Note that Internet Explorer version 9 is available only for Windows Vista, Windows 7 and later versions of Windows – in particular, it is not available for Windows XP. The applets also work on many mobile devices.

The applets were created using software called GeoGebra. You will see the GeoGebra logo when they load.

Detailed instructions for using each applet are displayed on the same web page as the applet, and you can click on the help button for more information. If you have trouble using the interactive controls in an applet, perhaps because you are using a touch screen or because of a disability,

then try the alternative controls that appear when you click ‘Show accessibility controls’. If you have further difficulties with using the applets, because of a disability, then see the advice in Section 3, Accessibility guide.

You can download the applets to your computer, to use offline, from the MST124 website.

## 2.3 Tutorial clips and videos

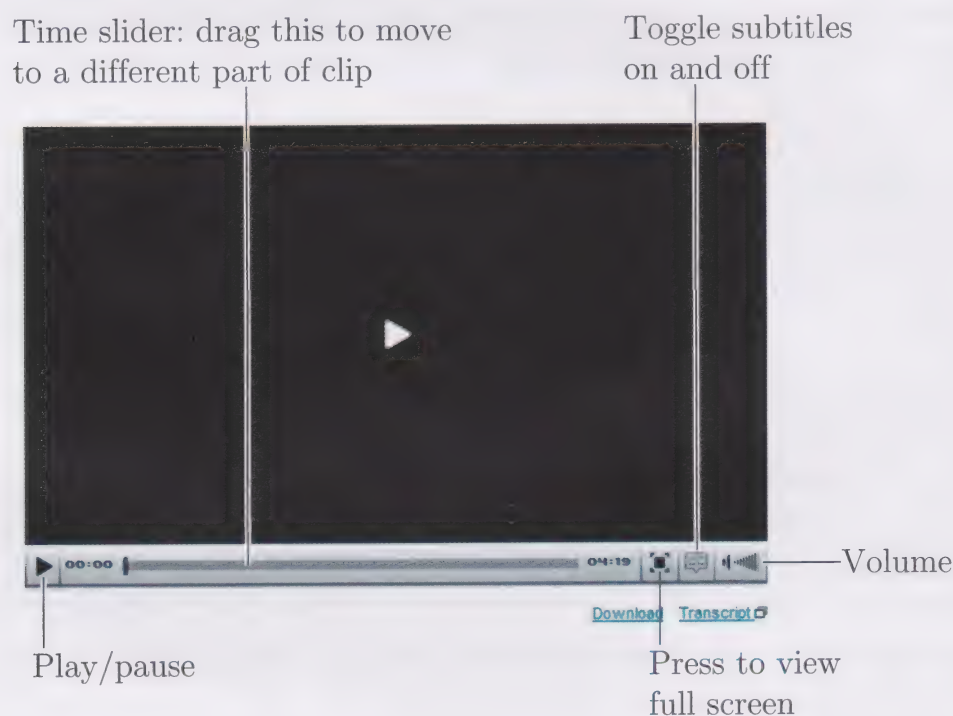
The tutorial clips and videos were described in Subsection 1.3. You can access them from the MST124 study planner.

To hear the audio of the tutorial clips and videos you need to have speakers or headphones connected to your computer.

If you have Adobe Flash Player installed on your computer, then when you click on the link for a tutorial clip or video you should see a video player window similar to the one shown in Figure 5. If you do not have Flash Player installed, then you will see one of the following.

- A message telling you that your computer does not have the appropriate software.
- An alternative video player. This video player may not have all the facilities of the one shown in Figure 5; for example, you may not be able to access the subtitles.

You can obtain Flash Player by visiting its installation site (see the Appendix) and following the instructions there. It is free to install and use.



**Figure 5** Video player window for tutorial clips and videos

To play a tutorial clip or video, click on the large play button in the centre of the video player window, or the smaller play button on the control bar



at the bottom. While the tutorial clip or video is playing, the play button on the control bar changes to a pause button – you can click this to pause the play. The other controls are shown in Figure 5. Note that if you turn the subtitles on or off, your choice will automatically be applied to all the other MST124 tutorial clips and videos.

You can download a tutorial clip or video to your computer, to use offline, by using the ‘Download’ link below the video player. Alternatively, you can download batches of tutorial clips from the MST124 website.

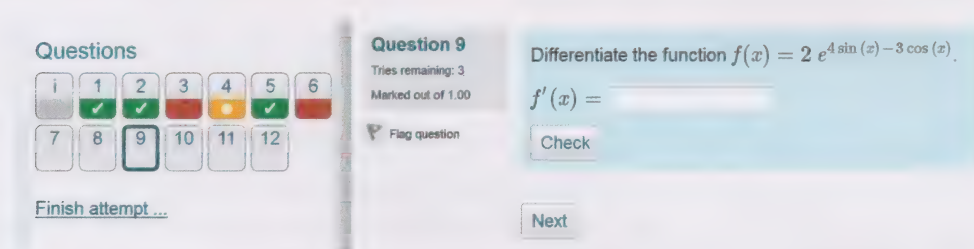
## 2.4 Practice quizzes and iCMAs

The practice quizzes and iCMAs (interactive computer-marked assignments) were described in Subsections 1.3 and 1.4, respectively. You can access them from the online MST124 study planner. You can also access the iCMAs from the ‘Assessment resources’ area of the MST124 website.

You need to be online while you are working on a practice quiz or iCMA, but you do not have to complete it in a single session – you can leave it and return to it as many times as you like.

### Practice quizzes

Figure 6 shows a typical practice quiz question. The question is on the right, with, in this case, a box in which to input your answer. On the left there is a navigation panel containing the numbers of all the questions in the quiz. You can click on one of the question numbers to move to that question. If you click on the ‘i’ at the top left of the navigation panel then you will see a page of instructions for the quiz. This page of instructions also appears when you first open the quiz, and you should read it carefully before starting the first question.



**Figure 6** A practice quiz question, with the navigation panel on the left

There is information on how to input your answers later in this subsection.

After you have input your answer to a question, or all of your part-answers in the case of a question with more than one part, click the ‘Check’ button. You will then receive computer-generated feedback. If your answer, or any of your part-answers, was incorrect, then you can click the ‘Try again’ button for another try. You are allowed three attempts at each question.

After your third attempt at a question, or after an attempt in which your answers to all parts of the question were correct, a worked solution will be

displayed and the lower half of the question number box in the navigation panel will be marked as follows.

- Green shading and a tick indicates that your final answer was correct.
- Amber shading and a circle indicates that some part-answers were correct and others were incorrect.
- Red shading indicates that your final answer was incorrect.

You can click the 'Next' button to move to the next question, or choose a different question from the navigation panel.

All the answers that you input, whether you checked them or not, are automatically saved when you move to another question. You can change your answers to a question at any time before you click the 'Check' button.

While you are working on a quiz it is best *not* to use the back or forward buttons of your web browser, as this may cause errors. Use the navigation panel instead.

When you close the quiz, all your saved answers are retained for your next session. When you return to the quiz, start by clicking the 'Continue last attempt' button.

When you have completed a quiz, a page containing a summary of what you have done will be displayed. If you want to exit a quiz without completing it, click the 'Finish attempt ...' link under the navigation panel, which will take you to the summary page. From the summary page you can click the 'Submit all and finish' button to end the quiz.

Alternatively, if you have not completed the quiz, you can click the 'Return to attempt' button to continue working on it. If you click 'Submit all and finish', then you will not be able to return to the quiz, but you can start it again, and usually the questions will be different.

## iCMAs

iCMAs are similar to practice quizzes, but have the following important differences.

- The score that you achieve counts towards your result for MST124.
- The questions have no check buttons, so you cannot check your answers. This means that you have only one attempt at each question, and you will receive no feedback, nor any indication of correctness, until you complete the whole iCMA and submit it.
- You cannot start the iCMA again once you have clicked the 'Submit all and finish' button. So you have only one attempt at the iCMA.
- When you have answered all parts of a question, the lower half of the question number box in the navigation panel is shaded grey.



You can leave an iCMA and return to it as many times as you like, and you can change your answers as many times as you like, until you click the 'Submit all and finish' button.

Make sure that you read the important information on iCMAs in Subsection 1.4.

**Remember!**

- Don't click the 'Submit all and finish' button until you are satisfied with all your answers to all the questions.
- Click the 'Submit all and finish' button by the cut-off date at the latest.

### Inputting answers in practice quizzes and iCMAs

For most questions, you have to input answers that are numbers or algebraic expressions.

To input a number, just type it, using a full stop for a decimal point if you need one. *Do not include any units, nor any indication of rounding.*

To input an algebraic expression, use the syntax in Table 5.

Note that, for trigonometric functions, angles are in radians, not degrees. Also in Table 5 the letter  $i$  denotes an imaginary number whose square is  $-1$ . You will meet this number in Unit 12.

The symbol used for powers ( $^$ ) is obtained by pressing **Shift** and **6** on a standard computer keyboard.

**Table 5** Syntax for answers to practice quiz and iCMA questions

Mathematics	Input syntax	Example
Addition	+	x+y
Subtraction	-	2-z
Multiplication	*	2*x+x*y
Division	/	x/3
Equals	=	y=m*x+c
Brackets	( and )	(2+x)*(x-3)
$\pi$	pi	2*pi
$e$	e	3*e
$i$	i	2*i+3
Power	^	x^2
Square root	sqrt	sqrt(2)
$e^x$	e^x or exp(x)	e^3 or exp(3)
Natural logarithm, ln	ln or log	ln(5) or log(5)
$ x $	abs(x)	abs(-3)
sin, cos, tan	sin, cos, tan	sin(pi/5)
$\sin^2 x, \cos^2 x, \tan^2 x$	sin(x)^2, cos(x)^2, tan(x)^2	sin(x)^2-cos(x)^2
$\sin^{-1}, \cos^{-1}, \tan^{-1}$	asin, acos, atan	asin(0.5)

You often have to include several pairs of brackets to input an algebraic expression correctly. For example, to input

$$\frac{3x^{1/3}}{4 + \sqrt{2}} + 3,$$

you should type (3\*x^(1/3))/(4+sqrt(2))+3.

Remember too that you must use \* for multiplication. For example, you must enter  $xy$  as x\*y, not xy. If you omit a \*, then in some cases the system will interpret your answer correctly, but in other cases it may not.

As you input your answer, it will be displayed as correctly formatted mathematics, so you can check that it is as you intend. *Make sure that you check this carefully.*

There are further details about practice quizzes and iCMAs in the online OU Computing Guide, under ‘iCMA (interactive Computer-Marked Assignments)’.

## 2.5 Online forums

The MST124 forums are online group discussion areas where you can post messages to be seen and replied to by other students and sometimes by tutors. You can find them in the right-hand column of the MST124 website.



When you visit a forum you will see a list of topics that are being discussed. To read a discussion, click on the topic. You can then reply to any of the messages on that topic. To start a new topic, press the 'Start a new discussion' button above the list of current topics.

You can choose to have all the new messages that are posted to a forum also emailed to your preferred OU email account. To opt into receiving these emails, click 'Subscribe' at the bottom of the main forum page. To opt out of receiving them, click 'Unsubscribe', which is displayed only if you have opted to receive them.

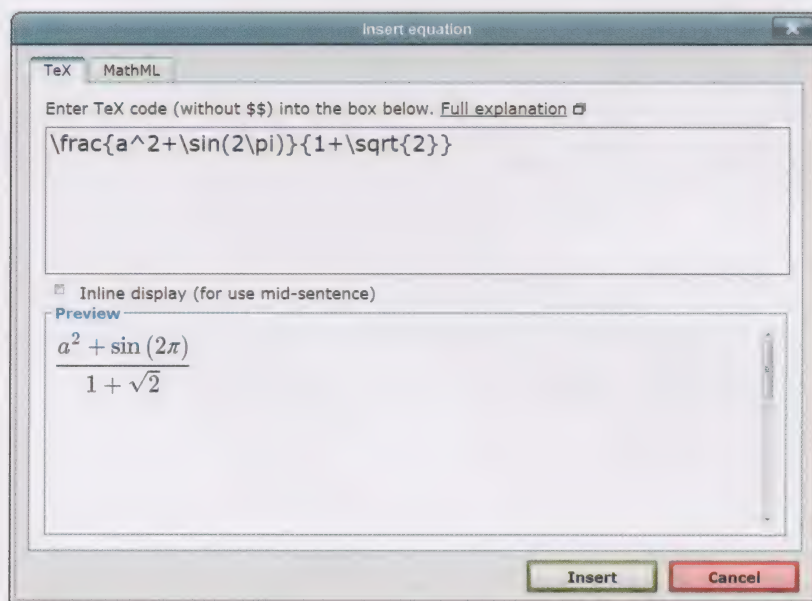
There is more information on online forums in the online OU Computing Guide, under 'Forums'.

## Mathematics in forum messages

You can include properly formatted mathematics in your forum messages, if you want. To do this, you type the mathematics using special syntax, which is taken from the L<sup>A</sup>T<sub>E</sub>X mathematical typesetting system. You should enclose this syntax between two double-dollar signs; that is, between  $$$$  and  $$$$ . For example, to include the expression  $3x + 2$  properly formatted in your message, type  $$$3x+2$$$ . Alternatively, at a point where you want to include mathematics in your message, click the 'Insert equation' button, which is



This will open the 'Insert equation' window (see Figure 7). Type the syntax in the box (in the page headed by the 'TeX' tab), *without* the  $$$$  signs. As you type, a preview of the formatted mathematics is displayed. Once you are satisfied with it, click 'Insert' to include the mathematics in your message.



**Figure 7** The 'Insert equation' window

Some examples of L<sup>A</sup>T<sub>E</sub>X syntax and the corresponding output are given in Table 6. The syntax includes many special commands, most of which have names that start with the backslash character \. Some commands are complete in themselves, whereas for others you have to include one or more objects for the command to ‘act on’.

To group a string of characters into a single object, enclose the string in curly brackets, { and }. For example, to obtain  $x^{12}$ , type `x^{12}`. If instead you type `x^12`, then you obtain  $x^12$ , because the 1 and 2 were not grouped as a single object.

It is often useful to enclose even a single character in curly brackets, to specify that it is an object for a command to act on. For example, to obtain  $\sqrt{x}$ , type `\sqrt{x}`.

You may not know the meaning of some of the mathematics in Table 6 at the moment, but you will learn it in MST124!

**Table 6** Syntax for mathematics in forums

Input	Output	Notes
<code>\alpha</code>	$\alpha$	To obtain any Greek letter, type its name preceded by \
<code>\pi</code>	$\pi$	
<code>x^{12}</code>	$x^{12}$	
<code>x_1</code>	$x_1$	
<code>\sqrt{2}</code>	$\sqrt{2}$	
<code>\frac{a+b}{c+d}</code>	$\frac{a+b}{c+d}$	To obtain other common functions, type their names preceded by \
<code>2 \times 3</code>	$2 \times 3$	
<code>\sin x</code>	$\sin x$	
<code>\ln x</code>	$\ln x$	
<code>x \approx 1.27</code>	$x \approx 1.27$	
<code>\mathbf{v}</code>	<b>v</b>	‘bf’ stands for ‘bold font’
<code>\int x^2 dx</code>	$\int x^2 dx$	
<code>\int_0^1 x^2 dx</code>	$\int_0^1 x^2 dx$	
<code>[x^2]_0^1</code>	$[x^2]_0^1$	
<code>\sum_{n=1}^{10} a_n</code>	$\sum_{n=1}^{10} a_n$	

There is more information on the syntax for mathematics in forums in the ‘Forums’ section of the online OU Computing Guide.



## Netiquette

When using the online forums, please follow appropriate online etiquette, known as *netiquette*, as outlined below.

Netiquette is the unwritten rule book for good behaviour online. Although the principles are similar to those for face-to-face conversation, the limitations of a text-based medium mean that you have to learn some new techniques. Other people can't see the expression on your face or hear your voice, so it is what you write that sets the tone of the conversation. It is best to adhere to the following ground rules.

### Thank, acknowledge and support people

People can't see you nod, smile or frown as you read their messages. If they get no acknowledgement, they may feel ignored and be discouraged from contributing further. Why not send a short reply to keep the conversation going? However, do bear in mind that in a large, busy forum, too many such messages could become a nuisance.

### Acknowledge before differing

Before you disagree with someone, try to summarise the other person's point in your own words. Then they will know that you are trying to understand them and will be more likely to take your view seriously. Otherwise, you risk talking *at* each other rather than *to* each other.

### Make your perspective clear

Try to avoid speaking impersonally: 'This is the way it is ...', 'It is a fact that ...'. This will sound dogmatic and leaves no room for anyone else's perspective. Why not start with 'I think ...'? A common abbreviation is IMHO (in my humble opinion) – or even IMNSHO (in my not so humble opinion). If you are presenting someone else's views, say so, perhaps by a quote and acknowledgement.

### Emotions

Emotions can easily be misunderstood when you can't see faces or body language. People may not realise that you are joking; irony and satire are easily missed. Smileys or emoticons such as :- ) and :-( can be used to express your feelings (look at them sideways). Other possibilities are punctuation (?! #@\*!), < grin > or < g >, < joke >.

Be aware of your audience: people from widely differing cultures and backgrounds may read what you write online. What you find funny may be offensive to them.

**DON'T WRITE IN CAPITALS – IT WILL COME OVER AS SHOUTING!**

### Flaming

If you read something that offends or upsets you, it is very tempting to dash off and submit a reply – but don't! Online discussion seems to be particularly prone to such 'flames', and things may escalate in a flaming

spiral of angry messages. So if you feel your temperature rising, take a break or sleep on it before replying.

### Additional advice

- Keep to the subject, and pick the right topic for your contribution.
- Before you write a message, take time to see what is being discussed, and how.
- Keep messages short.
- Write a good subject line (title) for your message – people often haven't time to read messages unless the subject line looks relevant.
- Keep to one subject (one topic of discussion) per message.
- When replying to a message, quote part of the earlier message only if you need to. Don't include everything, or messages get longer and longer.

Remember that you should not include details of solutions to assignment questions in forum messages, but it is acceptable to give advice to point other students in the right direction. For example, you can give a reference to an appropriate part of a unit.

## 2.6 Mathematics in webpages

Some of the mathematics on the module website (for example, in the iCMA and practice quiz questions) is displayed as images, by default. You can choose to have it displayed as MathML, the World Wide Web Consortium standard for mathematics, if your web browser supports it. This improves the display of the mathematics, and gives better results if you change the size or colour of the text for accessibility reasons, for example.

The following browsers support MathML.

- Firefox. This works best when additional fonts are installed. See the Appendix for details of a website that gives further information.
- Internet Explorer versions 7, 8 or 9 with the MathPlayer plug-in installed. See the Appendix for details of a website from which you can install this plug-in.

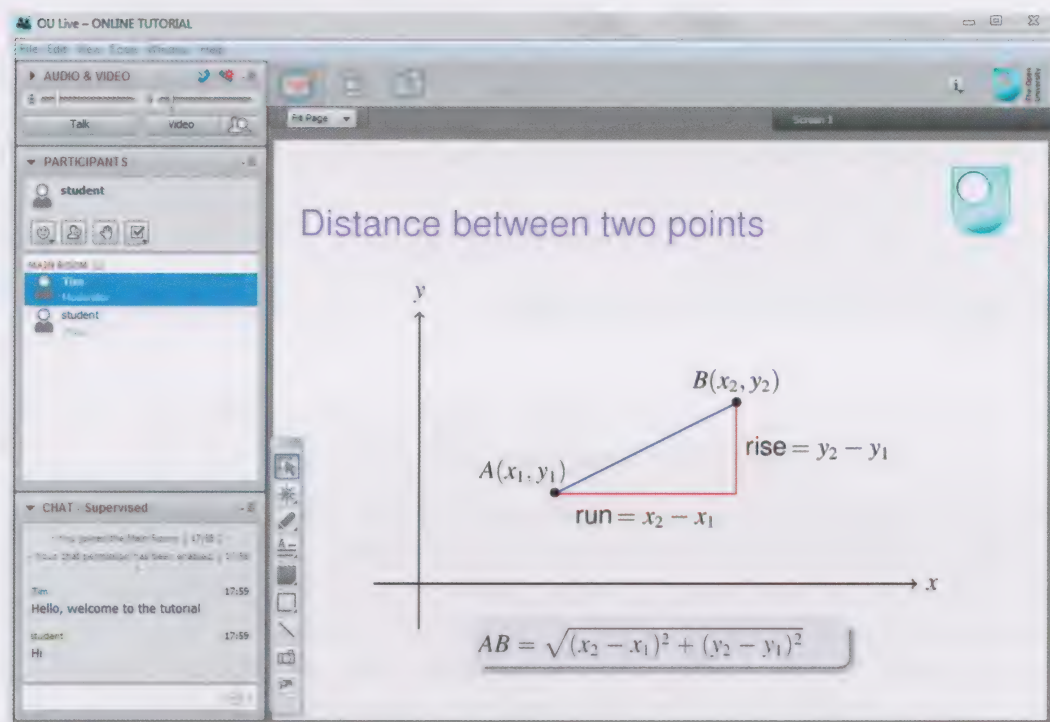
To switch to displaying mathematics as MathML rather than as images, click on any mathematics image to display the 'Equation information and settings' page, which provides detailed information about the particular piece of mathematics in the image. At the bottom of that page, select 'Use direct MathML output where possible' from the 'Display technology' drop-down menu, and then click 'Save changes'.

Once you have activated MathML, you can access the 'Equation information and settings' page by hovering the mouse pointer over a piece of mathematics and clicking the 'Equation info' link that appears.



## 2.7 Online tutorial rooms (OU Live)

Your MST124 tutor may provide online tutorials instead of, or in addition to, face-to-face ones. These will take place in online ‘rooms’, similar to the one shown in Figure 8, using a system called ‘OU Live (Blackboard Collaborate)’, or just OU Live, for short.



**Figure 8** An online meeting room

OU Live allows two-way communication using audio and text messaging, and the use of a shared on-screen whiteboard.

You can access the OU Live online rooms from the ‘Online tutorials’ area in the right-hand column of the MST124 website. Your tutor’s OU Live room should be selected for you by default, but you can select the room of any other MST124 tutor.

To use the online room you will need the following.

- A computer connected to the internet.
- Headphones to listen to your tutor and other participants. Alternatively, you can use speakers, but they can lead to sound problems when used at the same time as a microphone.
- A microphone to enable you to speak to your tutor and other participants. A combined headphone/microphone headset is recommended. You can participate in an online tutorial without a microphone, since you can communicate by text messaging, but it is best to have a microphone so you can participate fully.

There are further details of how to use the online rooms and configure your computer for OU Live in the online OU Computing Guide, under ‘Online rooms – OU Live’.

You should check that your computer is suitably configured, and test the system, several days before your first online tutorial.

## 2.8 OU Anywhere

If you have a smartphone or tablet with an iOS or Android operating system, then you can download the tutorial clips and videos, and electronic versions of the units, to your device by using the OU Anywhere app. You can download this app from the app store in the usual way.

There are further details in the OU Computing Guide.

## 3 Accessibility guide

This section is primarily aimed at those who may have difficulties with one or more elements of MST124 because of a disability, for example.

Mathematics is a visual subject involving the use of mathematical notation, graphs and diagrams. General accessibility advice for all mathematics modules is available in the document ‘Accessibility for mathematics and statistics modules’, which you can find in the ‘Accessibility’ section of the MST124 website. You are advised to read this document carefully. It outlines the general accessibility options for module materials and websites, and contains advice on presenting your mathematics and completing the assessment. The ‘Accessibility’ section of the MST124 website also contains other accessibility resources related to MST124, including updates to this section of the *MST124 Guide*, and useful web links.

This section of the *MST124 Guide* provides further accessibility advice specifically related to MST124.

Although the Open University has tried to avoid using inaccessible resources in MST124, and to provide accessible alternatives where possible, some material that is core for MST124 may not be easily accessible, even if you use assistive technology. You may need a non-medical helper to assist you.

If you think that you may need additional support during your study of MST124 and you have not already contacted the University about this, please visit the Services for Disabled Students website. It describes the range of support services that are available, and guides you through the procedure to request extra help. Alternatively you can discuss your needs with an adviser from your Learner Support Team. You can use the link in the Help Centre on your StudentHome page to find its contact details.



## 3.1 Components of MST124

### Printed materials

You can find the latest information about the different accessible formats available for the MST124 materials on the Services for Disabled Students website. Searchable PDF versions of printed material are available from the 'Study resources' section of the MST124 website, and figure descriptions of the diagrams, graphs and images are available from the 'Accessibility' section. However, mathematical content in PDF files is unlikely to be accessible using a screen reader.

### Applets

Many of the applets contain dynamic graphs and other diagrams that are not accessible to screen readers. If you have difficulty with viewing these diagrams and reading the text on them, then you may wish to consider the services of a non-medical helper.

Each applet has a 'Show accessibility controls' button. Clicking on this button reveals controls that enable you to change the thicknesses of lines and the colours used in the applet. It also reveals controls that you can use to interact with the applet, as alternatives to some of the default controls.

### Tutorial clips and videos

The tutorial clips and videos have been subtitled. To access the subtitles, you need to have Adobe Flash Player installed on your computer. You can then turn the subtitles on or off using a button on the video player control bar. Written transcripts are available from a link below the video player.

### Practice quizzes

The practice quizzes can be read by a screenreader. See the 'Accessibility for mathematics and statistics modules' document, from the 'Accessibility' section of the MST124 website, for details on how the mathematics can be read.

### Computer algebra system (CAS)

An important part of studying MST124 is learning how to use a computer algebra system. Guidance on the accessibility options for this software is given in the *Computer algebra guide*.

Summary of computer-based learning

Table 7 summarises the number of applets, the number of activities that use them, the number of tutorial clips, and the number of activities that use the computer algebra system (CAS) in each unit of MST124. It should help you to plan when you might need to allow extra time for a unit, or when you might need the assistance of a non-medical helper.

Note that although Unit 2 contains only one activity that uses the CAS, this is an extensive activity, which involves working through two sections of the *Computer algebra guide* and learning the basics of how to use the CAS. Unit 9 also requires extensive use of the CAS throughout the latter part of the unit.

**Table 7** Numbers of applets, tutorial clips and CAS activities

Unit	Applets	Activities using applets	Tutorial clips	Activities using CAS
1	0	0	20	0
2	1	1	17	1
3	2	6	12	3
4	3	1	8	1
5	0	0	11	2
6	2	2	11	0
7	0	0	19	2
8	1	1	16	4
9	0	0	4	5
10	0	0	16	2
11	1	1	12	1
12	1	1	13	3

3.2 Assessment

The assessment in MST124 that counts towards your final result consists of tutor-marked assignments (TMAs), online interactive computer-marked assignments (iCMAs) and an exam.

The TMAs are in PDF format, and descriptions of graphs and diagrams are supplied. You should be able to complete the TMAs successfully with appropriate support from your tutor or helper.

The iCMAs are submitted online and may have some interactive content. Like the practice quizzes, the iCMAs can be read by a screenreader.

If you have informed the University that you have additional requirements for the examination, then you will be contacted by a study adviser to discuss any special arrangements that you need.



If you are unable to submit all your assignments, or have difficulties during your revision or examination, then you are advised to report these special circumstances. Further details are given in the *Assessment Handbook*.

### 3.3 Studying MST124 without internet access

Studying MST124 without access to the internet is not permitted except in special situations, such as for students in prisons and other closed institutions.

If you are a student in such an institution, then the Open University Offender Learner Team, along with your own local education officers, will help manage your access to the module materials, and the submission of your assignments.

If you are permitted to study MST124 without internet access, then as well as the usual printed materials, you will receive an *Offline resources* disc, containing the applets, tutorial clips, videos and exercise booklets. This disc also contains practice quiz booklets, which are sets of further practice questions similar to those in the online practice quizzes.

It is not possible to provide offline versions of the practice quizzes or iCMAs.

In place of each iCMA you will receive an assignment that contains multiple-choice questions on the same topics as the iCMA questions.



## Appendix: further information

The sources of further information mentioned in this MST124 *Guide* are listed below. The name of each resource is followed by a sequence of links leading to the resource, or a URL, or both. Any updates to this information will be provided on the MST124 website.

### OU resources

#### StudentHome

[www.open.ac.uk/students](http://www.open.ac.uk/students)

#### MST124 website

StudentHome → MST124 Module Website

#### Study at the OU (MST124 page)

[www3.open.ac.uk/study/undergraduate/course/mst124.htm](http://www3.open.ac.uk/study/undergraduate/course/mst124.htm)

#### Skills for OU Study

StudentHome → Help Centre → During your studies → Study skills  
→ Skills for OU study

[www.open.ac.uk/skillsforstudy](http://www.open.ac.uk/skillsforstudy)

#### OU Computing Guide

StudentHome → Help Centre → Computing help → Computing Guide  
[learn1.open.ac.uk/site/computing-guide](http://learn1.open.ac.uk/site/computing-guide)

#### Mathematics and Statistics induction site

[www.open.ac.uk/learning/new/orientation-ug](http://www.open.ac.uk/learning/new/orientation-ug)

#### Being digital (OU Library resource)

<http://www.open.ac.uk/libraryservices/beingdigital>

#### OU Library

[www.open.ac.uk/library](http://www.open.ac.uk/library)

#### Assessment Handbook

StudentHome → Help Centre → Assessments, assignments and  
examinations → Assessment handbook

#### Services for disabled students

[www.open.ac.uk/disability](http://www.open.ac.uk/disability)

### External resources

#### Adobe Flash Player installation site

[get.adobe.com/flashplayer](http://get.adobe.com/flashplayer)

#### Firefox MathML fonts site

<https://developer.mozilla.org/en-US/docs/Mozilla/MathMLProject/Fonts>

#### Internet Explorer MathPlayer plug-in installation site

<http://www.dessci.com/en/products/mathplayer>



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- Unit 2 Graphs and equations
- Unit 3 Functions

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- Unit 4 Trigonometry
- Unit 5 Coordinate geometry and vectors
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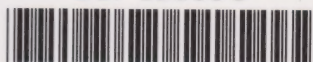
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